Environmental Assessment Summary
for Areas of Jefferson, Orleans, St. Bernard, and Plaquemines Parishes Flooded as a Result of Hurricane Katrina
December 9, 2005

Introduction

Hurricane Katrina made landfall on Monday, August 29, 2005 as a category 4 hurricane. The storm brought heavy winds and rain to Southeast Louisiana, breaching several levees and flooding up to 80% of New Orleans and large areas of Plaquemines and St. Bernard Parishes. Much of the area that was flooded in Hurricane Katrina was re-flooded by storm surge from Hurricane Rita. The flooded areas were declared unwatered by the U.S. Army Corps of Engineers (USACE) on October 11, 2005. Sediments ranging in depths from less than an inch to several feet were left behind by the floodwaters in areas impacted by levee overtopping and breaches. However, large portions of the impacted area had little or no sediment deposited.

As local governments and individuals make decisions related to re-entry and habitation, one of the commonly asked questions is the extent to which one should be concerned about environmental contamination of air, land, and water resulting from the hurricanes. The following summary is intended to provide a general assessment of the results of sampling to date. It has been developed based upon input from the Centers for Disease Control (CDC), Agency for Toxic Substances and Disease Registry (ATSDR), Louisiana Department of Environmental Quality (LDEQ), Louisiana Department of Health and Hospitals (LDHH), the U.S. Environmental Protection Agency (USEPA), and the Federal Emergency Management Agency (FEMA). This information was developed based on outdoor sampling.

This summary does not include environmental data collected at individual sites, such as the Murphy Refinery oil spill area in St. Bernard Parish, where the site is being addressed by the responsible party with LDEQ and USEPA oversight. It also does not address indoor environmental issues associated with re-entry into flooded homes and structures. These issues are being addressed separately.

Environmental Testing and Assessments

Immediately after Hurricane Katrina's landfall, an intensive environmental testing effort began in the impacted areas. An incident management team was assembled with representatives from LDEQ, USEPA, U.S. Coast Guard (USCG), USACE, National Oceanographic and Atmospheric Administration (NOAA), LDHH, U.S. Geological Survey (USGS), and the Louisiana Oil Spill Coordinator's Office (LOSCO) working from a Unified Command Center. The Texas Commission on Environmental Quality also provided several of its Strike Teams to assist. New airborne and remote-sensing technologies were employed to assist with assessing environmental threats. Ground teams began a systematic sampling effort of floodwaters, sediments, and air quality. LDEQ and USGS began sampling in Lake Pontchartrain to assess potential impacts of

floodwater that was being pumped from New Orleans back into Lake Pontchartrain. NOAA, LDHH, U.S. Food and Drug Administration (FDA), and LDEQ began sampling seafood to determine if any possible contamination resulted from floodwaters.

Floodwaters

Floodwaters from the East Bank Greater New Orleans area have been extensively tested. Nearly 400 water samples were collected by LDEQ and USEPA to represent the flooded areas and the discharges of the floodwater to Lake Pontchartrain. Each of these samples was analyzed for nearly 200 chemicals. Numerous floodwater samples revealed elevated bacteria levels. This would be expected from commingling floodwaters with sewage collection system waters, resulting in unsanitary conditions. Average concentrations of chemicals were below levels of concern for short-term (i.e. 90 days) dermal contact and incidental ingestion. A small number of floodwater samples contained concentrations of chemicals that exceeded the 90-day exposure levels. However, there was realistically no circumstance that would lead to continuous exposure to floodwaters much beyond a few days. The pump water discharge sampling results were very similar to discharged storm waters sampled from Orleans and Jefferson Parishes from 2001 to 2004. Toxicity testing of the pump water discharge showed no reason for concern for toxicity to aquatic animals or adverse affect on the health of Lake Pontchartrain. Data from over 100 bacteria samples taken at over 50 stations in the Lake Pontchartrain area during September and October by USGS and LDEQ showed very low concentrations in Lake Pontchartrain proper and always within recreational standards. Preliminary results from fish and shellfish samples taken from Lake Pontchartrain and Lake Borgne, as well as the near shore Gulf of Mexico, are below levels which would warrant concern for seafood consumption. FDA stated publicly on October 21 that they do not support a ban on seafood consumption.

As of October 11, 2005, the floodwaters were removed from the area and thus no longer serve as a source of exposure to residents returning to impacted areas.

Sediments

Sediment Quality in Flooded Areas

Much of Orleans, Plaquemines, and St. Bernard Parishes were flooded from Hurricane Katrina. Sediments of varying depths were left behind by the floodwaters primarily in areas impacted by levee overtopping and breaches. However, large portions of the impacted area had little or no sediment deposited. Soils in areas that did not flood were generally unchanged by Hurricane Katrina. This statement addresses sediments sampled within flooded areas. Sediment from flood water is defined here as residuals deposited by receding flood waters which may include historical sediment from nearby water bodies, soil from yards, road and construction debris, and other material. It does not address sediments in the Murphy Refinery oil spill area in St. Bernard Parish, which are being addressed separately.

What Was The Extent of Sediment Sampling?

From September 10 through October 14, USEPA collected sediment samples at 430 sites in the streets and public areas of Jefferson, Orleans, Plaquemines and St. Bernard Parishes. USEPA's sampling procedures specified that efforts were to be made to bias the samples toward areas that were more likely to contain elevated levels of contamination such as areas that contain oily sediment or large stains. Each sample was tested for fecal coliform bacteria and about 200 different chemicals including volatile organic compounds (VOC), semi-volatile organic compounds (SVOC), metals, pesticides, herbicides, polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAH), and total petroleum hydrocarbons (TPH).

On November 10, LDEQ collected 23 samples of sediments from representative areas where sediment depth exceeded 0.5 inch. Each sediment sample was analyzed for arsenic, lead, PAHs, and TPH.

On November 19 and 20, USEPA and LDEQ revisited approximately 145 previous sediment sample locations where contaminant concentrations exceeded LDEQ and USEPA criteria. For re-sampling to occur, the sediment depth had to exceed a depth of 0.5 inch. Sediments of sufficient depth were found at 14 locations, and were re-sampled to determine current conditions. Samples were analyzed for the same chemical constituents as was done for the earlier September 10 – October 14 sampling.

USEPA has continued some sediment sampling in the Ninth Ward and areas in St. Bernard Parish, and analyses are underway.

What Do The Test Results Show?

September 10 – October 14 Sediment Sampling:

As expected in a densely populated urban area, a variety of chemicals were detected in the sediments. The most frequently detected chemicals included some metals, petroleum hydrocarbons, and PAHs, and to a lesser extent, pesticides. These levels are similar to the historical levels found in these parishes before Katrina and to other urban areas throughout the nation. The majority of chemicals detected were below levels of health concern. However, there were some localized areas with levels of arsenic, PAHs and diesel and oil range organics that exceeded both LDEQ Risk Evaluation/Corrective Action Program (RECAP) and USEPA's risk criteria (e.g., range of 1 in 1,000,000 to 1 in 10,000 risk of an individual developing cancer over a lifetime) based on long-term (30 years) residential exposure assumptions**.**

The levels of fecal coliform bacteria and petroleum hydrocarbons in the sediments also exceeded health screening values. However, these levels are expected to naturally decrease over time.

November 10 Sediment Sampling:

Analytical results indicate that the chemicals tested for are not present in the sediment at levels of concern. Arsenic was found at levels similar to background soil levels. Lead and TPH were found to be present at levels that are below the long-term health-based standard for residential

areas with the exception of two locations within the Lakeview area. At one of these locations, lead only slightly exceeded the long-term residential health-based standard and at the other location, diesel range TPH was present at a level twice the long-term residential health-based standard. PAHs were not detected in the sediment with the exception of fluoranthene which was detected at one location in the Ninth Ward at a level that was less than 1/6 of the long-term residential health-based standard.

November 19-20 Sediment Sampling:

The 14 locations resampled on November 19 and 20 were initially analyzed for those chemicals that exceeded LDEQ and USEPA criteria (e.g. diesel and oil range organics, arsenic, and benzo-a-pyrene). The test results provided here reflect those analyses only. Subsequently, USEPA analyzed for the nearly 200 chemicals that all samples had been analyzed for in their past sampling, but these remaining data are currently being validated.

In Orleans Parish, three samples contained arsenic above the RECAP value of 12 ppm (Louisiana's accepted background level), with levels ranging from 14.4 to 17.6 ppm. One sample contained benzo(a) pyrene above the RECAP value of 0.33 ppm with a level of 0.77 ppm. Although the levels in these four samples exceed RECAP values, they fall within a risk range of 1 in 1,000,000 to 1 in 10,000 risk of an individual developing cancer over a lifetime from exposure to those concentrations, which USEPA has found acceptable in other contexts.

In St. Bernard Parish, one sample contained diesel range organics above the RECAP value of 650 ppm, with a level of 2100 ppm. USEPA and LDEQ believe the diesel range organics value is associated with the Murphy Oil spill, which is currently being addressed by the responsible party with USEPA and LDEQ oversight. USEPA and LDEQ are working together to determine next steps.

Each sampling location has been geographically referenced and information concerning locations where contaminant levels exceeded risk screening levels will be available from USEPA and LDEQ following completion of confirmatory sampling.

Should an area be found to pose an unacceptable risk after confirmatory sampling, USEPA will work with LDEQ and FEMA to ensure proper removal and disposal under the National Response Plan (NRP).

Additionally, FEMA may authorize removal of soils and mud resulting from the hurricanes for the purpose of removing an impediment for access.

Landscaping and Gardening

Louisiana State University Agricultural Center scientists recently collected soil and sediment samples from five areas in Jefferson and Orleans Parishes – Kenner, Lakeview, City Park, Mid-City and Old Metairie. They reported that their results indicate that gardeners do not need to worry about soil salinity and heavy metal content in the areas tested. There should be no problem

with digging or planting in the soil. Growing vegetables for consumption is not affected, and there is no need for special soil treatment before replanting.

What Steps Should You Take?

The great majority of the data available show that adverse health effects would not be expected from exposure to the sediments from the previously flooded areas, provided people use common sense and good personal hygiene and safety practices. However, as noted previously, certain contaminants were detected in localized areas at concentrations higher than background or LDEQ RECAP levels for long-term residential land use. As a precaution, direct and frequent skin contact with sediments should be avoided to the extent practicable.

Chemical analysis of airborne particles taken over the past two months by USEPA and LDEQ show concentrations below levels of concern. However, if sediment materials are dried and stirred-up, they may cause a nuisance dust problem. Breathing in the dust may irritate your lungs and cause coughing. For sensitive people, it may also irritate skin and cause rashes. Good personal hygiene should be practiced when working with or near exposed sediments.

- Wear gloves, boots and safety glasses.
- Wear a dust mask (an N-95 dust mask is recommended and can be purchased at your local pharmacy or building supply stores).
- Keep arms and legs covered. Wear long sleeves and long pants.
- Wash hands frequently with soap and water.
- Wash work clothes separate from other laundry.

These are routine safety precautions recommended by public health agencies after hurricanes and flooding incidents where inundation has occurred and flooded soils and sediment deposits are left behind.

Re-establishing grass or vegetative covers will help control dust in yards. Use simple measures like using a garden hose to rinse off sidewalks and driveways to ensure dust is not tracked into the house. Exposure to dust is expected to decrease over time due to growth of vegetation over exposed the residual sediments.

Obvious signs of hazardous materials or oil spillage should be avoided and reported to the appropriate officials. Questions concerning situations at specific residences will need to be addressed on a case by case basis. If you have additional questions you can call toll free 1-888-763-5424 or 1-225-342-1234 (LDEQ) for more information.

Air Quality

LDEQ and USEPA have conducted extensive air sampling in the area impacted by Hurricane Katrina. This effort includes the following:

- Continuous criteria pollutant monitoring at Kenner for ozone, nitrogen oxides (NOx), sulfur dioxide (SO_2), hydrogen sulfide (H_2S), carbon monoxide (CO), and particulate matter (PM)
- VOC samples collected in Summa canisters and each canister analyzed for nearly 100 toxic air pollutants
- The USEPA mobile Trace Atmospheric Gas Analyzer (TAGA)
- USEPA's Airborne Spectral-imagery of Environmental Contaminants Technology (ASPECT), and
- Portable VOC and particulate samplers.

All of the results collected to date for ambient air quality samples appear to be typical for this region of the state and are below any levels of health concern. LDEQ and USEPA scientists and toxicologists have studied the data and agree the results meet all federal and state PM standards. A review of PM 2.5 (fine particulate) data shows concentrations below levels of concern. None of the samples have picked up any detectable levels of asbestos fibers or any detectable levels of PAHs.

The VOC samples and TAGA data showed some elevated readings of pollutants immediately after the storm. However, subsequent sampling has shown that the levels of pollutants have returned to pre-Katrina levels. All concentrations of the toxic air pollutants are below the USEPA one year screening levels and below the Louisiana ambient air standards.

As part of the ongoing monitoring plans, LDEQ will replace and enhance the New Orleans area air monitoring sites destroyed by the storm. In addition, USEPA plans to complete installation of 19 temporary ambient air monitoring sites throughout southeastern Louisiana. Two of the USEPA sites are being configured as National Air Toxics Trend Sites. National Air Toxic Trend Sites will be established and enhanced. These stations are providing long term air quality data that is being posted on USEPA's Hurricane Response web site as it becomes available.

Conclusions

Floodwater samples revealed elevated bacteria levels associated with untreated sewage. The pump water discharge sampling results were very similar to discharged storm waters sampled from Orleans and Jefferson Parishes from 2001 to 2004. Unwatering of the flooded areas of Orleans, St. Bernard, Jefferson, and Plaquemines Parishes has been completed and floodwaters no longer serve as a source of exposure to residents returning to impacted areas.

All of the results collected to date for ambient air quality samples appear to be typical for this region of the state and are below any levels of health concern. The VOC samples and TAGA data showed some elevated reading of pollutants immediately after the storm. However, subsequent sampling has shown that the levels of pollutants have returned to pre-Katrina levels. A review of PM 2.5 (fine particulate) data shows concentrations below levels of concern. All concentrations of the toxic air pollutants are below the USEPA one year screening levels and below the Louisiana ambient air standards.

In general, the sediments located in areas flooded by the hurricanes in Orleans, St. Bernard and Plaquemines Parishes are not expected to cause adverse health effects provided people use common sense and good personal hygiene and safety practices. The levels of fecal coliform bacteria and TPH in the sediments were initially elevated, but they are expected to naturally decrease over time. As expected in an old, densely populated urban area, a variety of chemicals were detected in the sediments. In general, other VOCs, SVOCs, pesticides, and metals were at levels that would not be expected to result in adverse health effects. However, in areas where sediment samples contained contaminant levels exceeding LDEQ and USEPA criteria, further investigation is underway to adequately characterize the nature and extent of contamination. Should an area be found to pose an unacceptable risk after confirmatory sampling, USEPA will work with LDEQ and FEMA to ensure proper removal and disposal under the NRP. Additionally, FEMA may authorize removal of soils and mud resulting from the hurricanes for the purpose of removing an impediment for access.

As sediments dry out, the fecal coliform bacteria would not be expected to survive, and the hazard represented by the bacteria will decrease. The elevated levels of TPH are likely attributable to urban background TPH levels associated with surface runoff from roadways in combination with releases of petroleum products from vehicles submerged under floodwaters. In some localized areas, elevated TPH levels may be attributable to known releases of petroleum products.

Good personal hygiene should be practiced with frequent hand washing, laundering of clothing, and cleaning of the homes (i.e. vacuuming, dusting, etc). Efforts should be made to avoid tracking sediments into homes from un-vegetated or uncovered areas, as well as stirring up dust from those same areas. Obvious signs of hazardous material or oil spillage should be avoided and reported, as well.

While the detected levels of contaminants may not pose an unacceptable health risk for most people, some individuals may be bothered by dust raised by disturbances of the sediment. It is therefore recommended that efforts be made to minimize contact and take measures to minimize dust (reestablish lawn, rinse off sidewalks and driveways etc).

Exposure to the majority of residual sediment contaminants is expected to decrease over time due to growth of vegetation and the degradation and dispersion of these chemicals from natural processes in the environment.